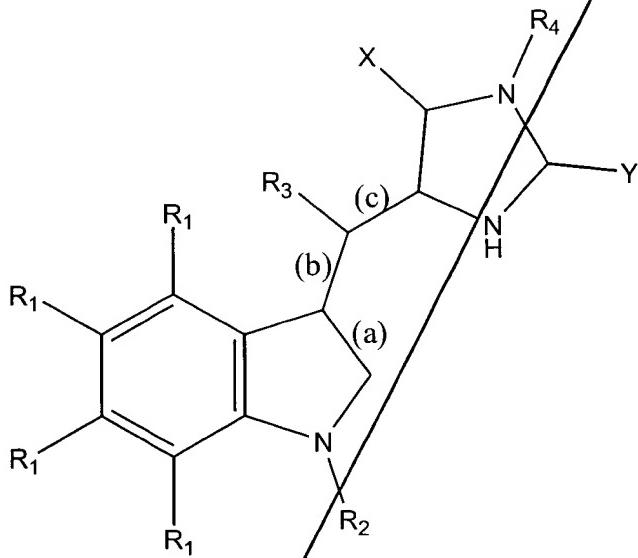


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1. A chemical compound in a pharmaceutically acceptable carrier, said compound having the formula:



wherein

each R₁ is independently selected from the group consisting of hydrogen, methyl, carboxy, hydroxyl, methoxyl, amino, and nitro;

R₂ is selected from the group consisting of hydrogen, alkyl, and acyl;

R₃ is selected from the group consisting of alkyl, acyl, halogen, hydrogen, or hydroxyl;

R₄ is selected from the group consisting of methyl, hydroxyl, carboxyl, and linear and branching alkyl groups;

X is selected from the group consisting of =O, -OH and -H;

Y is selected from the group consisting of =S and -SR₅, where R₅ is either hydrogen or an alkyl group; and

each of the bonds (a), (b), and (c) independently is either a double or

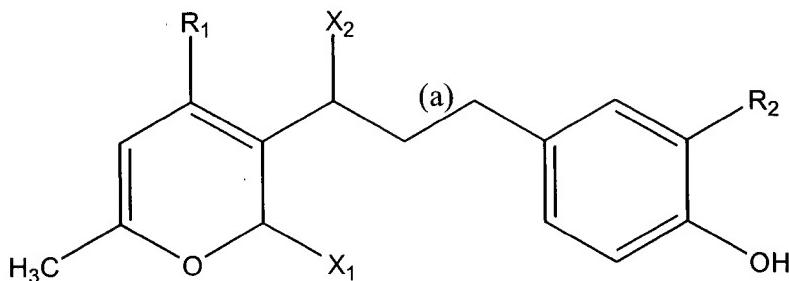
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single bond, provided, however, that bond (a) and bond (b) are not both double bonds.

2. The compound of claim 1, wherein each R_1 is hydrogen;
5 R_2 and R_3 are each hydrogen;
 R_4 is a methyl group;
 X is =O;
 Y is =S;
bond (a) is a double bond, and
bonds (b) and (c) are each single bonds.

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3. A compound in a pharmaceutically acceptable carrier, said compound having the formula:



wherein

each of X₁ and X₂ is independently selected from the group consisting of

5 =O,

-OH and -H;

R₁ is selected from the group consisting of hydrogen and a hydroxyl;

R₂ is selected from the group consisting of hydrogen, sulfate, nitro, and halide; and

10 the bond (a) is either a single or double bond.

4. The compound of claim 3, wherein

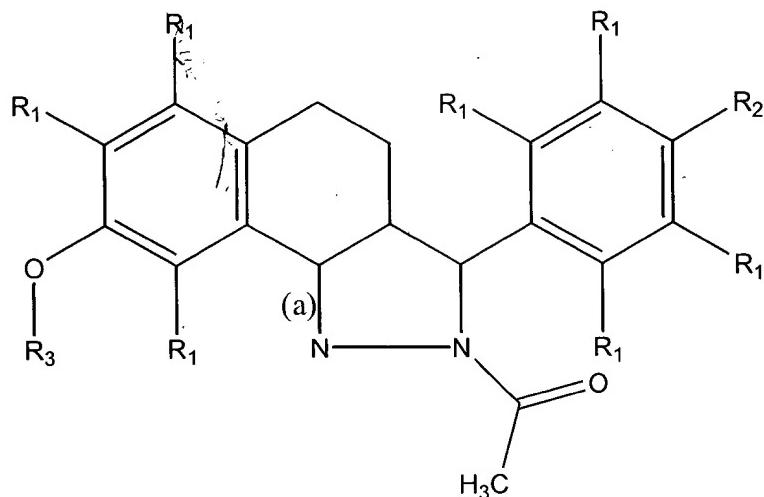
each of X₁ and X₂ is =O;

R₁ is a hydroxyl group;

R₂ is a nitro group; and

15 the bond (a) is a double bond.

5. A chemical compound in a pharmaceutically acceptable carrier, said compound having the formula:



wherein

each R_1 is independently selected from the group consisting of
5 hydrogen, amino, halide, and hydroxyl;

R_2 is selected from the group consisting of hydrogen, halide, and hydroxyl;

R_3 is selected from the group consisting of hydrogen and methyl; and the bond (a) is either a single or double bond.

10 6. The compound of claim 5, wherein

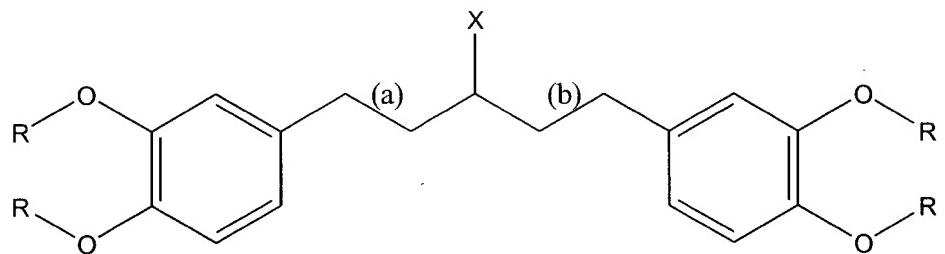
each R_1 is hydrogen;

R_2 is fluorine;

R_3 is a methyl group; and

the bond (a) is a double bond.

7. A chemical compound in a pharmaceutically acceptable carrier, said compound having the formula:



wherein

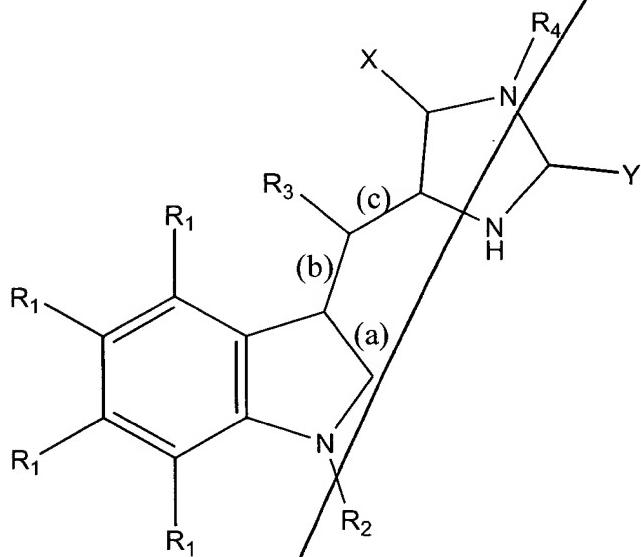
each R is independently selected from the group consisting of H or CH₃;
the bond (a) is either a single or double bond;
the bond (b) is either a single or double bond; and
X is selected from the group consisting of =O, -OH and -H.

8. The compound of claim 7, wherein

each R is CH₃;
the (a) and (b) bonds are each a double bond; and
X is =O.

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9. A method for decreasing necrosis, said method comprising contacting a cell with a chemical compound, said compound having the formula:



wherein

each R₁ is independently selected from the group consisting of hydrogen, methyl, carboxy, hydroxyl, methoxyl, amino, and nitro;

5 R₂ is selected from the group consisting of hydrogen, alkyl, and acyl;

R₃ is selected from the group consisting of alkyl, acyl, halogen, hydrogen, or hydroxyl;

10 R₄ is selected from the group consisting of methyl, hydroxyl, carboxyl, and linear and branching alkyl groups;

X is selected from the group consisting of =O, -OH and -H;

Y is selected from the group consisting of =S and -SR₅, where R₅ is either hydrogen or an alkyl group; and

each of the bonds (a), (b), and (c) independently is either a double or

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cont

single bond, provided, however, that bond (a) and bond (b) are not both double bonds.

10. The method of claim 9, wherein in said compound each R₁ is hydrogen;

5 R₂ and R₃ are each hydrogen;

R₄ is a methyl group;

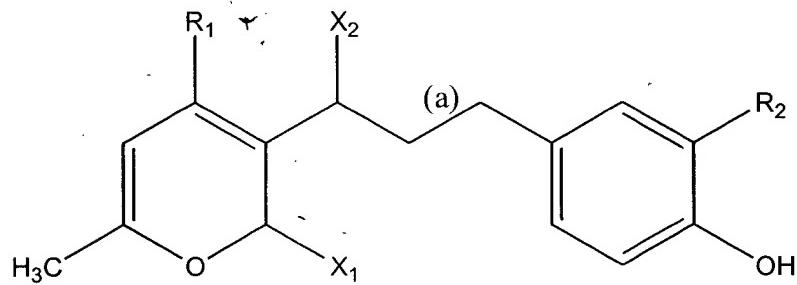
X is =O;

Y is =S;

bond (a) is a double bond; and

10 bonds (b) and (c) are each single bonds.

11. A method for decreasing necrosis, said method comprising contacting a cell with a chemical compound having the formula:



wherein

each of X_1 and X_2 is independently selected from the group consisting of

5 =O,

-OH and -H;

R₁ is selected from the group consisting of hydrogen and a hydroxyl;

10 R₂ is selected from the group consisting of hydrogen, sulfate, nitro, and halide; and

the bond (a) is either a single or double bond.

12. The method of claim 11, wherein in said compound,

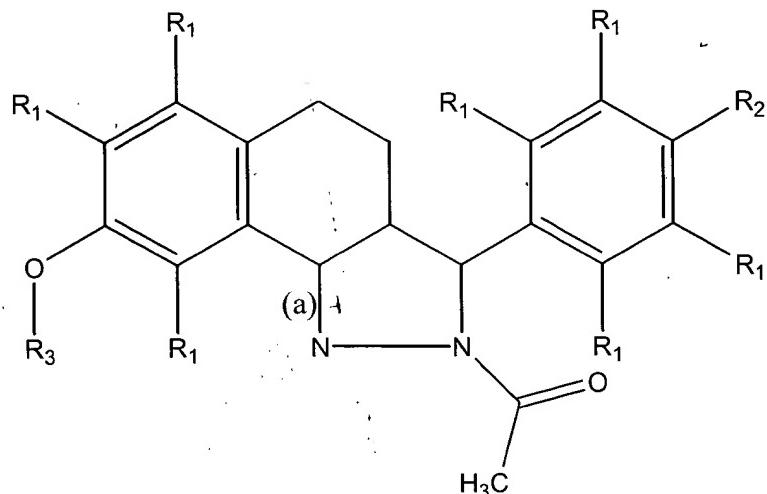
each of X_1 and X_2 is =O;

R₁ is a hydroxyl group;

R₂ is a nitro group; and

15 the bond (a) is a double bond.

13. A method for decreasing necrosis, said method comprising contacting a cell with a chemical compound having the formula:



wherein

each R_1 is independently selected from the group consisting of hydrogen, amino, halide, and hydroxyl;

R_2 is selected from the group consisting of hydrogen, halide, and hydroxyl;

R_3 is selected from the group consisting of hydrogen and methyl; and the bond (a) is either a single or double bond.

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14. The method of claim 13, wherein in said compound

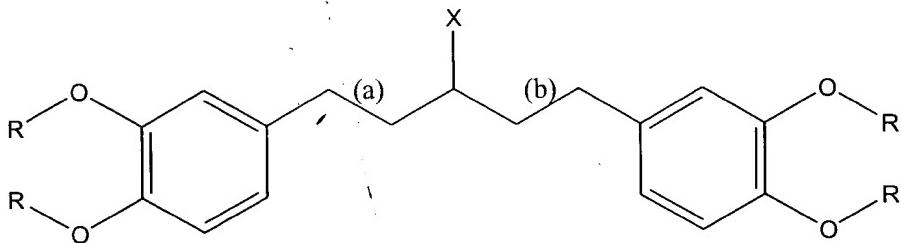
each R_1 is hydrogen;

R_2 is fluorine;

R_3 is a methyl group; and

the bond (a) is a double bond.

15. A method for decreasing necrosis, said method comprising contacting a cell with a chemical compound having the formula:



wherein

each R is independently selected from the group consisting of H or CH₃;
the bond (a) is either a single or double bond;
the bond (b) is either a single or double bond; and
X is selected from the group consisting of =O, -OH and -H.

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16. The method of claim 15, wherein in said compound

each R is CH₃;

the (a) and (b) bonds are each a double bond; and

X is =O.

17. The method of any of claims 9, 11, 13, or 15, wherein said cell is

capable of undergoing necrosis in the presence of zVAD-fmk and TNF α .

18. The method of any of claims 9, 11, 13, or 15, wherein said cell is capable of undergoing necrosis in the presence of zVAD-fmk and DMSO.

19. The method of any of claims 9, 11, 13, or 15, wherein said cell is mammalian.

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20. The method of claim 19, wherein said cell is human.

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21. The method of claim 19, wherein said cell is a neuron.

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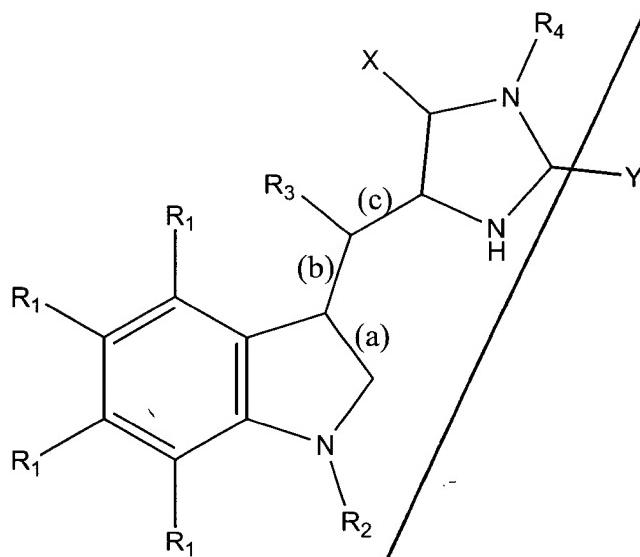
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22. The method of claim 19, wherein said cell is a rodent cell.

23. The method of any of claims 9, 11, 13, or 15, wherein said compound is in a pharmaceutically acceptable carrier.

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24. A method for treating a condition in a subject, said method comprising the steps of administering a chemical compound having the formula:



to said subject, in a dosage sufficient to decrease necrosis, wherein

each R₁ is independently selected from the group consisting of

hydrogen, methyl, carboxy, hydroxyl, methoxyl, amino, and nitro;

R₂ is selected from the group consisting of hydrogen, alkyl, and acyl;

R₃ is selected from the group consisting of alkyl, acyl, halogen,

hydrogen, or hydroxyl;

R₄ is selected from the group consisting of methyl, hydroxyl, carboxyl,

and linear and branching alkyl groups;

X is selected from the group consisting of =O, -OH and -H;

Y is selected from the group consisting of =S and -SR₅, where R₅ is

either hydrogen or an alkyl group; and

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each of the bonds (a), (b), and (c) independently is either a double or single bond, provided, however, that bond (a) and bond (b) are not both double bonds.

25. The method of claim 24, wherein in said compound

5 each R_1 is hydrogen;

R_2 and R_3 are each hydrogen;

R_4 is a methyl group;

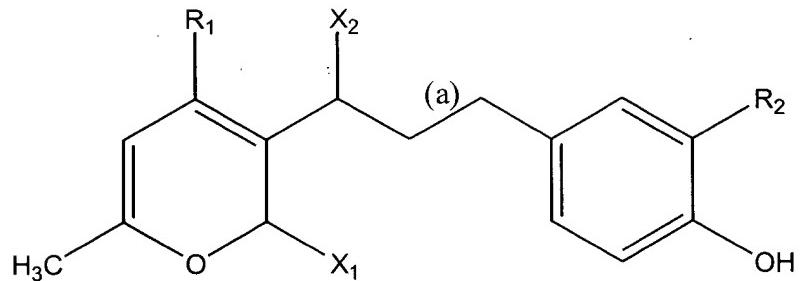
X is =O;

Y is =S;

bond (a) is a double bond; and

10 bonds (b) and (c) are each single bonds.

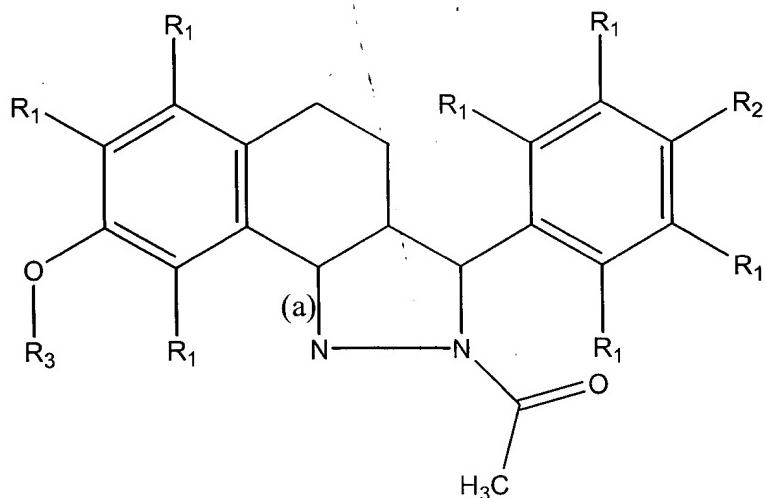
26. A method for treating a condition in a subject, said method comprising the steps of administering a chemical compound having the formula:



to said subject, in a dosage sufficient to decrease necrosis wherein
each of X₁ and X₂ is independently selected from the group consisting of
5 =O,
 -OH and -H;
R₁ is selected from the group consisting of hydrogen and a hydroxyl;
R₂ is selected from the group consisting of hydrogen, sulfate, nitro, and
halide; and
10 the bond (a) is either a single or double bond.

27. The method of claim 26, wherein in said compound
each of X₁ and X₂ is =O;
R₁ is a hydroxyl group;
R₂ is a nitro group; and
15 the bond (a) is a double bond.

28. A method for treating a condition in a subject, said method comprising the steps of administering a chemical compound having the formula:



to said subject, in a dosage sufficient to decrease necrosis wherein

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each R₁ is independently selected from the group consisting of hydrogen, amino, halide, and hydroxyl;

R₂ is selected from the group consisting of hydrogen, halide, and hydroxyl;

R₃ is selected from the group consisting of hydrogen and methyl; and the bond (a) is either a single or double bond.

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29. The compound of claim 28, wherein in said compound

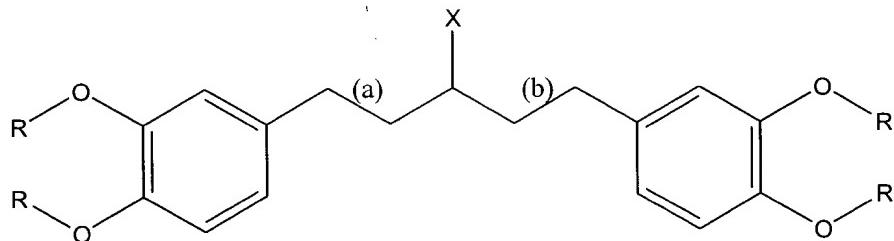
each R₁ is hydrogen;

R₂ is fluorine;

R₃ is a methyl group; and

the bond (a) is a double bond.

30. A method for treating a condition in a subject, said method comprising the steps of administering a chemical compound having the formula:



to said subject, in a dosage sufficient to decrease necrosis wherein

- 5 each R is independently selected from the group consisting of H or CH₃;
 the bond (a) is either a single or double bond;
 the bond (b) is either a single or double bond; and
 X is selected from the group consisting of =O, -OH and -H.

- 10 31. The compound of claim 30, wherein in said compound
 each R is CH₃;
 the (a) and (b) bonds are each a double bond; and
 X is =O.

- 15 32. The method of any of claims 24, 26, 28, or 30, wherein said
 condition is a neurodegenerative disease.

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34 33. The method of claim 32, wherein said neurodegenerative disease is
 selected from the group consisting of Alzheimer's disease, Huntington's disease,

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cerebral ischemia, stroke, amyotrophic lateral sclerosis, multiple sclerosis, Lewy body disease, Menkes, disease, Wilson disease, Creutzfeldt-Jakob disease, and Fahr disease.

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34. The method of any of claims 24, 26, 28, or 30, wherein said condition is selected from the group consisting of ischemic brain injury, ischemic heart injury, and head trauma.

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35. The method of any of claims 24, 26, 28, or 30, wherein said subject is a mammal.

Line 15 AF

36. The method of claim 35, wherein said subject is a human.

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37. The method of claim 35, wherein said subject is a rodent.

38. A method for identifying a compound that decreases necrosis, comprising the steps of :

- (a) providing a cell in which apoptosis is prevented;
- (b) contacting said cell with a first compound that causes a cell to undergo necrosis;
- (c) contacting said cell with a second compound; and
- (d) measuring necrosis relative to a control cell,

wherein a decrease in necrosis indicates that said second compound decreases necrosis.

39. The method of claim 38, wherein said apoptosis is prevented by contacting said cell with zVAD-fmk.

40. The method of claim 38, wherein said first compound is TNF α or DMSO.

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